Space Spin-offs

Objectives

- Students will discover the medical and technological advances, and space spin-offs that have occurred in the space program as a result of space exploration.
- Students will research information on space spin-off and decide which one they feel is the most valuable to society.
- Students will use an every day technology on Earth and decide how it could benefit the space program.

Suggested Grade Levels

4^{th} – 8^{th}

Subject Areas

Science

Timeline

One to two class periods

Standards

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Science and Technology

- Abilities of technological design
- Understandings about science and technology

Science in Personal and Social Perspectives

- Science and technology in society

History and Nature of Science

- Science as a human endeavor

Background

Space spin-offs are technologies that have been developed by the aerospace industry that have found their way into mainstream society. These technologies make our lives easier on Earth, but were first developed by the space industry. Most people don't realize how much these technologies impact their daily lives. Most people cannot go through a day without being impacted by it. Whether it be drinking Tang® for breakfast after sleeping on a Tempur-Pedic® mattress, or using their ATM card while shopping, all of these technologies were first

developed by the space industry. The purpose of this lesson is to get students to think about how much their life is impacted by space.

The teacher must be familiar with space spin-offs that have made their way into society. Some examples are: Tang®, Velcro®, the blue gel in pampers, water filtration systems, satellites for cell phones and TV, the rubber on the bottom of tennis shoes, breathing apparatus for firefighters, MRI and CT-scan technology, medicines to fight cancer, water filters, and Tempur-Pedic® foam.

Here are the uses of some of these items in the space industry:
Tang®: Developed for the Mercury, Gemini, and Apollo missions as a nutritious drink
Velcro®: Used to keep utensils and equipment in place in microgravity
Pampers gel: Used in diapers worn by astronauts prior to launch and during Extra Vehicular Activities (EVA or spacewalk) just in case
Water Filtration: Used to purify water systems for Advanced Life Support situations
Firefighter Breathing Apparatus: Developed from EVA spacesuits
Tempur-Pedic® Foam: Developed for shuttle seats and headrests to support astronauts during take-off
MRI and CT Equipment: Developed to analyze astronaut health after long-term duration space missions

As we continue to explore space, other technological advances will be made. The benefits, however, must outweigh the risks of exploration. There isn't a doubt that as we continue to explore the technological and medical benefits we discover will make exploration of the solar system worthwhile.

Vocabulary
Space spin-off,

Materials
Various space spin-offs available for the class: pampers with the blue absorbent gel, Velcro, Tang®, toothpaste, water filtration systems, Tempur-Pedic foam®, etc., computers with internet access

Lesson
1. Have students analyze the materials that the teacher brought into class.
2. Ask the students to see if they can determine how these materials may have been used in the space industry.
3. Have students do research on materials that were spin-offs from the space industry.
4. Have each student pick one or two items that was researched that each student feels has benefited society the most.
5. Have each student prepare a report to share with the class on each item or items. (If possible, have the student bring in an example of the item.)

Extensions

Have students pick something from every day life that could be used in the space industry, or have them invent something that could be used in the space industry.

Evaluation/Assessment

Evaluate each report to determine if the student did adequate research and was prepared for the presentation.

Resources

European Space Agency (ESA) Spin-offs
http://www.esa.int/esaKIDSen/Spacespinoffs.html

Jet Propulsion Laboratory (JPL) Spin-offs
http://spaceplace.jpl.nasa.gov/en/kids/spinoffs.shtml

NASA Spin-offs
http://www.thespaceplace.com/nasa/spinoffs.html

Space Foundation Space Certification Program
http://www.spaceconnection.org/

Space Research and Technology Transfer
http://www.seds.org/technology/spinoffs.shtml

University of Texas Spin-offs
http://www.tsgc.utexas.edu/spaceexplorers/activities/Spinoffs.pdf